

**University of Alabama at Birmingham
Auburn University
Deep South Center for Occupational Health and Safety
Reporting Period: July 1, 2013 – June 30, 2014
Principle Investigator: Claudiu T. Lungu, PhD**

SECTION I

PROJECT SUMMARY

By meeting its mission of developing professionals who protect and promote the health and safety of workers through interdisciplinary education, research, and outreach programs, the Deep South Center has been an occupational safety and health resource to the Southeast region since 1982. The Center Administrative Core is located in the Department of Environmental Health Sciences, University of Alabama at Birmingham (UAB) School of Public Health, and includes an Executive Committee, Board of Advisors, Outreach, Diversity, Pilot Project Research Training programs, and interdisciplinary coordination. The Center provides opportunities for masters and doctoral studies in the fields of industrial hygiene (IH) at the UAB School of Public Health, occupational health nursing (OHN) at the UAB School of Nursing, and occupational safety and ergonomics (OSE) and a specialty in occupational injury prevention research training (OPIRT) at the Auburn University College of Engineering. Our well established academic programs have nationally-recognized faculty members with a performant research agenda involving our trainees which is reflected by the high number of publications and presentations, research grants and professional awards. The trainees in all academic programs are engaged in research projects and outreach activities that instill in our students an appreciation of the interdisciplinary nature of the occupational safety and health professions. Many of our students were recognized by earning national and regional professional awards as well as high school-wide distinctions and scholarships.

RELEVANCE

The regional impact of our academic programs is indicated by the fact that approximately 65% of our graduates are still practicing in the occupational safety and health professions in the southeast. We are also involved in research applicable to the industries in our region and our outreach and continuing education programs have enhanced the knowledge and skills of practitioners through our offering of 50 relevant training courses and seminars reaching over 1630 attendees.

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ERC WEB LINK: www.uab.edu/dsc

**University of Alabama at Birmingham
Auburn University
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Annual Program Highlights
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**Continuing Education
Outreach and Diversity Recruitment
Program Director: Elizabeth Maples**

During this reporting period, July 2013 – June 2014, the CE Program was involved in activities across our region and offered 50 courses reaching over 1630 attendees. The CE Program moved forward through offering several new training opportunities, most designed through collaborative efforts with other providers. We have strong relationships with the local professional associations throughout our region of the American Industrial Hygiene, the American Society of Safety Engineers and the American Association of Occupational Health Nurses. Strong ties with our region's ERCs (Sunshine ERC and North Carolina ERC) add to the potential of impact for worker health and safety. We are also collaborating with the MAP ERC using their online platform to provide continuing education programs on a national and global scale.

Several significant programs continue to have impact to promote occupational health and safety and specifically for reaching low-wage, immigrant working populations. The ERC is involved in *FIESTA* an annual event that celebrates the Hispanic and Latino culture in Alabama. The ERC is involved through FIESTA's health and wellness village and distributes safety and health information including pamphlets on workers' rights, OSHA Fact Sheets (in Spanish and English) and hearing protection. ERC graduate students volunteer and participate where needed to engage the event's attendees.

Our annual Institute in Environmental and Occupational Health and Safety has now been successfully offered for six years. Each year we build on the lessons learned and evaluation process to offer a dynamic learning experience for undergraduate students to inform them about graduate programs and careers in occupational health and safety. This year, we had a record number of qualified students apply to attend the Institute. A committee selected the top qualifying students based on their academic achievements, commitment to the program while also focusing on having a strongly diverse cohort.

**Occupational Health Nursing
Program Director: Jennan Phillips**

The innovative distance accessible program that prepares Adult/Gerontology Primary Care Nurse Practitioners with specialization in Occupational Health Nursing had an average enrollment of 13 students for 2013-2014; 5 students graduated, passed their Certification examination and are now Board Certified Nurse Practitioners providing primary care and treating injured or ill workers. One PhD student successfully defended her dissertation entitled: Obesity, Prediabetes, and Perceived Stress in Municipal Workers; she has a tenure track faculty appointment and continues as a nurse practitioner and worksite employee health clinic manager.

Although the OHN program is distance accessible, all students were on campus for ERC required interdisciplinary field work activities and additional worksite visits with OHN faculty. OHN students made site visits to: steel mills (mini-mill & major); hot water heater and fire extinguisher manufacturers; a paper mill; a limestone quarry; and a simulated and working underground coal mine. NP students completed a minimum of

180 hours of patient care with an OEM physician or OH NP specifically treating injured and ill workers as part of the 600 advanced practice clinical hours required to be board certified. Other opportunities to interact with OEM physicians occurred during site visits to industry with on-site OEM physicians and on-campus seminar discussions.

OHN faculty and students published 11 manuscripts in peer-reviewed journals, delivered 6 national and 1 regional presentation(s) specific to workplace health and safety, served on 4 journal editorial boards, and developed and currently offer the online DOT Medical Examiner Certification Review Course through an UAB e-learning portal.

Industrial Hygiene

Program Director: Claudiu T. Lungu

How to improve sensitivity in air sampling for gasses and vapors? **Claudiu Lungu** together with recently Industrial Hygiene graduate **Evan Floyd** (currently assistant professor at University of Oklahoma) and an interdisciplinary team from UAB proposed the use of carbon nanotubes in passive air samplers. Having similar adsorption properties as the more common activated carbon, carbon nanotubes are also excellent thermal conductors. This property will be used to release the sampled gases and vapors by irradiating the sampler with energetic visible light eliminating the chemical desorption, or the more expensive and time consuming thermal desorption technique currently used in the laboratory practice. The team was awarded a R21 grant by NIOSH in September 2013 and continues to work together with doctoral student Jonghwa Oh on improving this technique by fabricating and characterizing carbon nanotube adsorbent pads (buckypapers) and developing a new personal air sampler prototype for gases and vapors.

How to make better fitting respirators? Paula **Joe** graduated with a PhD in industrial hygiene in May 2014. Her graduate work with **Dr. Lungu** resulted in a series of three peer reviewed publications which focus on a. Taking anthropometric measurements and 3D images of human faces using a relatively low-tech laser scanner, b. Fit test commercially available respirators on the five skin analog head sets fabricated in our lab based on latest NIOSH anthropometric data and c. Use computer techniques to create the image of the face piece that will fit the image of one of the new head sets and use 3D printing and mask-making molding to make a prototype of the face piece. Their work was recently featured in the UAB magazine (<http://themixuab.blogspot.com/2014/09/using-3d-printers-and-movie-modeling.html>).

Productivity and awards: The industrial hygiene students were involved in research working with faculty and being the authors or co-authors of published articles, presentations and posters. In the reported period the group has published six articles and had two more accepted for publication, authored 15 abstracts and presented at numerous regional, national and international conferences, Paula **Joe** and Megan **Moore** winning awards for their posters at the AIHc&e in San Antonio, TX. A number of industrial hygiene students were awarded scholarships from various local and national professional organizations and from UAB. The School of Public Health awards annually the Outstanding Student Award to one masters and one doctoral student. In 2014 the Outstanding doctoral student award went to Evan **Floyd** and the Outstanding masters student award went to Samantha Connell, both Industrial hygiene program graduates.

Occupational Safety and Ergonomics

Program Director: Richard Sesek

Auburn's Occupational Safety and Ergonomics Program (OSE) received accreditation from the Human Factors and Ergonomics Society (HFES) for the period of January 2014 through January 2020. This accreditation benefits the students of Auburn's program by allowing graduates to be "fast-tracked" to certification as an Associate Ergonomics Professionals (AEPs) by the Board of Certification in Professional Ergonomics. Auburn placed 1st in National Ergonomics Competition for Student Design Teams. The team was comprised of Jean **Ketzler** (OSE MISE), Viviana **Valenzuela** (OSE MISE), Brittani **Edwards** (OSE MISE), Menekse **Salar** (OIP PhD), and Menglu Li (OSE MISE). A second team also participated and finished with an honorable mention. It consisted of Patrick **Almas** (OSE MISE), CW **Perr** (OSE PhD), Joe Abulhassan (OSE PhD), Tenchi Gao (OSE PhD), and Nick **Smith** (OSE PhD). Rio **Tang** and Rich **Sesek** were faculty advisors to both teams. Both teams consisted entirely of OSE/OIP trainees.

The OSE program has enjoyed good productivity during the performance period. These include: 5 published journal articles and 1 in press and 1 currently in review; 4 published conference proceedings; 2 conference papers/presentations accepted for presentation; student presentations at local ASSE and AIHA meetings; and multiple faculty presentations to industry.

Faculty Honors and Awards: **Dr. Richard Sesek** was promoted to Associate Professor and Tenured ; and **Dr. Robert Thomas** was honored with the William H. Weems Lifetime Achievement award at the 27th Annual Alabama Governor's Safety and Health Conference.

Occupational Injury Prevention Highlight

Director: Sean Gallagher

The OIP program had a large number of products during the performance period. These included: 5 published journal articles, 1 journal article in press and 1 currently in review; 4 published conference proceedings and 2 more accepted; 3 student presentations at local ASSE and AIHA meetings; 3 faculty presentations to industry; and a student presentation to the Auburn Fall 2013 Graduate Engineering Research Showcase (awarded Best Poster from ISE).

All OIP PhD students continued to progress in their studies during the current period. Michael **Porter** (OIP PhD student) has a dissertation topic (fatigue failure theory to assess musculoskeletal disorder risk in a manufacturing environment). Ms. **Lynch** collected data for her dissertation topic (ergonomic exposures to forestry equipment operators). Ms. **Salar** has just begun her research (modeling of low-back structures using MRI).

Dr. Gallagher, PI of the OIP program, was awarded *the International Ergonomics Association/Liberty Mutual Medal for Occupational Safety and Ergonomics* at the HFES Conference (10/13, San Diego). The winning study presented a new theoretical framework for understanding the musculoskeletal disorder (MSD) risk factors of force and repetition. These risk factors have typically been treated as separate and distinct from one another; however, this paper suggests that these two risk factors interact in a specific manner to affect MSD risk. The authors examined epidemiology studies and found that repetition had a vastly different effect on MSD risk depending on the amount of force involved. Typically, increased rates of repetition had a modest effect on risk for low force tasks, while the effect of repetition with high force tasks was greatly magnified.

Dr. Gallagher went on to observe that the pattern of risk observed in the epidemiology studies is precisely what would be expected if MSDs were the result of a fatigue failure process in the affected tissues. Fatigue failure begins when a sufficient force is imposed to create a small area of damage in the exposed tissue. If the tissue continues to experience forceful loading, the weakened area of the tissue will start to expand. This paper details how the rate of expansion is a function of both the force applied and number of repetitions experienced.

Faculty Honors and Awards: **Dr. Gallagher** was installed as a Fellow of the American Industrial Hygiene Association